SIEMENS

MAMMOMAT Novation DR

SP

Replacements of Parts

System

Replacement of Parts

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General information

These instructions describe how to replace various parts in the MAMMOMAT Novation^{DR}. The methods described are the most efficient.

Product-specific notes

Switching on the system

1. Switch the external main power switch in the room **ON**.
2. Verify that the generator and BRICK power up properly.
3. Press the power **ON** button on the control console to activate the MAMMOMAT Novation^{DR}. The internal monitoring system automatically performs a functional check of the MAMMOMAT Novation^{DR}. When the detector wing is selected, **dr** is displayed on the film density display of the control panel to indicate that communication with the MAMMOMAT Novation^{DR} system is functioning.
4. Wait approximately **2 - 5 minutes**.
5. Switch the PC and the screen **ON** at the acquisition workstation.

System power supply

Before you begin working on equipment, it is very important that you disconnect it from the main power supply at the main circuit breaker. Before removing or inserting any of the printed circuit boards, switch off the equipment.

⚠WARNING

If the system is switched off just at the control panel, the line voltage is still present at the generator line connection (see wiring diagram).

Life-threatening electric shock hazard exists.

➪ **Disconnect the mains cable and follow the instructions presented here.**

⚠WARNING

After the system shuts down, there may still be 380 V DC present on the intermediate circuit.

➪ **Life-threatening electric shock hazard exists.**

Printed circuit boards

⚠CAUTION

The printed circuit boards contain highly electrostatically-sensitive components.

The components could be damaged if proper precautions are not taken.

➪ **Use ESD equipment, ground prior to making contact, and place the components on a conductive surface.**

Metal curtain

⚠WARNING

The edges of the metal curtain on the stand are very sharp.

They may cause severe injury.

- ➪ **Apply the protective strips after removing the covers from the stand. Remove the protective strips only when the covers are to be mounted or when vertical adjustment of the swivel-arm system is necessary.**

Measurements with the oscilloscope

⚠WARNING

Under no circumstances should the existing ground conductor in the mains cable be disconnected when operating the oscilloscope.

Life-threatening electric shock hazard exists.

- ➪ **Use the differential amplifier to take measurements for which any resulting ground loop may falsify the result (difference measurement).**

Service software

The service PC is required for the MAMMOMAT stand service software.

NOTE

When the generator is switched off and the service PC connected, wait approximately 5 seconds before switching it on again.

Delay times between two exposures

Delay times listed below must be observed to prevent the tube from overheating.

Exposure mAs value	Delay time between two exposures (seconds)
max 100	min 15
max 200	min 30
max 300	min 45
max 400	min 60
max 500	min 75

Acceptance test

Whenever a new MAMMOMAT Novation^{DR} system is installed or performance-affecting changes are made to an existing system, it is recommended that the MAMMOMAT Novation^{DR} acceptance test be performed.

The MAMMOMAT Novation^{DR} acceptance test includes a number of QC procedures, based on the part that was replaced. These procedures are described in this **Quality Control Manual** and ensure that basic image quality criteria are met before the system is used with patients.

Depending on the country where the system is installed, additional tests have to be performed.

- Tests according to RöV §16 regulations must be performed in **Germany**.
- Tests according to DHHS regulations must be performed in the **USA**.

  Maintenance measurements must be made according to the **DHHS Maintenance Instructions** (SPB7-250.662.01...) and the **DHHS Supplements to the instructions for use** (SPB7-250.661.01...). Results must be recorded in **DHHS Measurement certificates** (SPB7-250.663.01...).

Replacement of the FFDM detector

General

If a detector has to be replaced, the spare part material number **08881307** (with the REP status) must be ordered. The Headquarters Support Center may need to release the delivery. From a mechanical standpoint, it is not difficult to disassemble the **old** detector and assemble the **new** detector.

NOTE

However, removing and subsequently mounting the detector involves the handling of expensive parts of considerable weight and size. The detector has to be moved and held at the same time. Four Allen screws have to be turned. While only one CSE can perform the other tasks, these work steps require two people. It is best, however, if two CSEs perform the entire procedure together.

The entire procedure takes approximately 14 working hours.

At the time of this writing, there are MAMMOMAT Novation^{DR} systems in the field with the DROC Workstation and the Women's Health Acquisition Workstation WH AWS (syngo). Therefore, these instructions describe replacing the detector on both systems. Disassembling the **old** detector and mounting the **new** detector on the MAMMOMAT Novation^{DR} stand are relatively straightforward and the same for the two variants. Other replacement tasks for these two systems are also similar. The tasks may need to be performed somewhat differently due to differences in the operating systems and application software.

These instructions first describe mechanical disassembly and subsequent mounting. Then the subsequently required tasks, consisting mainly of checks of several adjustments and calibrations and the AEC tests, are described. The replacement procedure is considered successful when the results of selected tests from the Quality Control Manual QC-M fall within the required tolerances. Task descriptions address the differences between the two workstations.

Handling of included parts

The new detector arrives in a special cardboard box designed to provide thermal insulation during transport. Open the cardboard box carefully. The same cardboard box has to be used to return the removed detector. Follow the instructions in **Unpacking the detector** as described either:

- in Chapter 7, **Installation Instructions and Start-Up (DROC)**, SPB7-250.812.01, or
- in Chapter 4, **System Startup with WH AWS**, SPB7-250.815.01.

The package should contain:

- The FFDM detector,
- A detector-specific CD-ROM (with the detector-specific files),

- One temperature logger triggered at the time of dispatch from the factory /CS Material Logistics,
- One temperature logger to be triggered by the CSE when returning the uninstalled detector according to the CS spare parts return procedure (to activate the logger, press the button marked PUSH TO START on the short side of the logger for about 10 sec. Activation will be confirmed by a brief, simultaneous flash of the green and red LEDs).

The detectors are serialized IVKs and are subject to product tracking regulations. The replacement should be documented with entries in the LINA / P42 product tracking tool, indicating the serial number of both the old and new detectors. The removed detector, its CD-ROM, and an activated temperature logger must be returned immediately in accordance with the return process. Be sure to include the temperature logger from the **old** detector.

Warranty agreements between Siemens Medical Solutions and the original equipment manufacturer stipulate that the temperature loggers that monitor temperature during transport and storage be activated not only when the new detector is shipped, but also when the old detector is returned, even though it is presumed faulty. In addition, the detector must always be accompanied by the CD-ROM with the detector-specific files.

Documents required

As mentioned above, two versions of the MAMMOMAT Novation^{DR} have been delivered to the customers worldwide.

The replacement procedure requires all the technical documents originally delivered with the unit and/or supplied with later updates/upgrades. These include, in particular:

- **Installation Instructions and Start-Up (DROC)**, SPB7-250.812.01...
- **System Startup with WH AWS**, SPB7-250.815.01...

In addition to the technical documentation, the

- **Instructions for Use** and the
- **Quality Control manual** are needed.

Tools and test equipment required

- The CSE standard toolbox
- The phantoms and the test equipment listed in the specific tests of the relevant QC manual and installation instructions or startup manual, depending on the kind of workstation installed.

Procedures and work steps

Preparatory tasks, unpack and check replacement detector

The CSE must be familiar with:

- Chapter 4 - **Detector installation of the System Startup with WH AWS**,
  or with:
- Chapter 7 - **Detector installation of the Installation Instructions and Start-Up (DROC)**.

Handling of the long-term temperature logger in detector replacements

When unpacking the detector, check whether the red LED is flashing on the enclosed activated temperature logger with the label "active". Document the results; note the time and date of the check and the serial number of the detector.The logger must be returned together with the defective replacement detector.If the red LED is flashing, the detector must be packaged and returned in accordance with the appropriate regulations. The second logger must be activated and included.

The defective detector must be removed and packaged in accordance with the corresponding regulations. The enclosed second temperature logger with the label "Return" must be included with the detector that is being returned and must be activated as follows:

- Press the button marked "PUSH TO START" on the side of the recorder for approx. 10 sec.
- Activation is confirmed when both the green and red LED light up simultaneously for a brief period.

All cautionary notes in those documents apply unconditionally.

- Unpack the detector according to the instructions.
- Check the temperature logger accompanying the detector.
- Document the results; note the time and date of the check and the serial number of the detector.
- Verify that the CD-ROM with the detector-specific files is included in the shipment.
- Remove the detector from the package and put it in a secure place; keep the package to return the replaced detector.
- Compare the serial number on the detector itself to the serial number on the CD (this number should correspond to the number in the file name of the detector-specific files).
- Verify that the detector received is equipped with two Teflon rails, one on each side. (If not, the rails from the other detector must be removed and used instead. In this case use the new bolts (8x M6x10) to secure the rails and discard the old bolts).
- Verify that the delivery contains an unused temperature logger to accompany the return delivery.
- To ensure correct reassembly of the grid and grid holders, it is very important to install the grid sliders and screws at the same location from which they were removed (different slider width!).

Disassembling the old detector

NOTE

The following tasks include removing several sets of different, rather small, precision-type screws, some of them with a fine thread. High-quality screwdrivers and appropriately sized Allen keys are required to prevent damage to the screws. Before beginning these tasks, reserve a safe place to briefly store the screws. Do not lose them; they will be re-used later in the same locations. Although the recommendation has been made, at this time spare full sets of screws are not available to replace any damaged or lost screws.

Removing the two metal covers and carbon-fiber cover of the detector

1. Move the vertical carriage up into a convenient position; the swivel arm with the tube-head should be upright, i.e., in the **0° (degree)** position.
2. Switch the system **OFF**.
3. To remove the upper rear metal cover of the object table assembly, unscrew the four M2 x screws on the circumference. The cover fits tightly and may be slightly jammed by the bellows; remove it carefully by slowly lifting the front.
4. To remove the lower rear metal cover of the object table assembly, unscrew the six M3 x screws on the bottom.
5. To remove the carbon-fiber cover of the object table, unscrew the six M3 x screws on the bottom first, then very carefully pull the cover out horizontally to avoid damage to the reciprocating grid, (see (1/Fig. 1 / p. 12)).

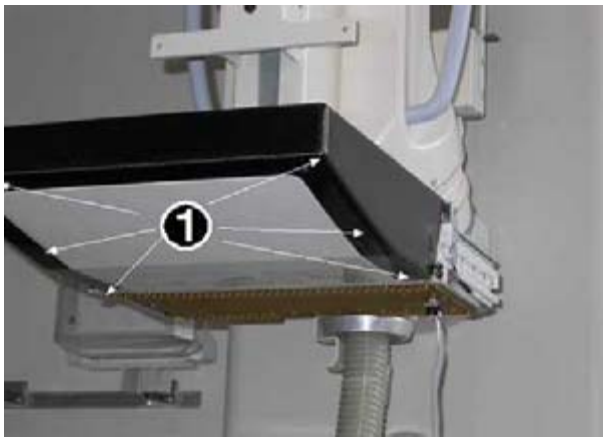

Fig. 1: Remove carbon cover

Removing the metal cover of the detector main cable connector

1. Remove the metal cover from above the detector main cable connector. This cover is fixed with two Allen screws M3 x; remove them. (See (1/Fig. 2 / p. 13) and (1/Fig. 3 / p. 13))
2. Unscrew the screws that secure the plug and socket of the detector cable connector to each other and disconnect them. The shape clearly indicates how to plug this connector back in.

Fig. 2: Remove cable cover

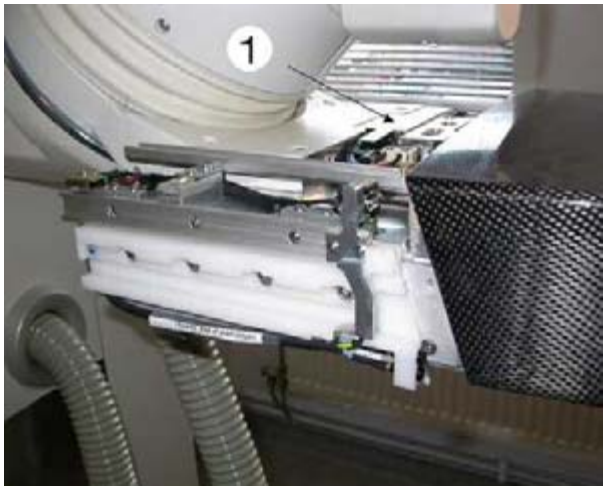

Fig. 3: Remove cable cover - different view

Removing the S2 & S3 switches from the grid and grid holders

1. Mark the position where the front and rear carrier brackets (holders) of the magnification table locator (or grid position) micro switches S2 and S3 are fastened to the object table support plate. (Such markings may already have been made at the factory). These micro switches are on the left side of the plate and they can be adjusted only with the magnification table. It is not possible to adjust them if the customer has no such table. Draw lines around both carrier brackets of these switches so they can be fastened back in the same position. (See (1/Fig. 4 / p. 14)).

2. Unscrew and remove the Allen M3 x screws on the carrier brackets (holders) of micro switches; the carrier brackets will loosen. This will allow access to the two Allen screws M5 x (See (3/Fig. 4 / p. 14)) which fix the detector on the left side to its carrier plate on the "flying wing". The two Allen screws M5 x (3/Fig. 6 / p. 15) that fix the detector to its carrier plate on the right side are readily accessible.

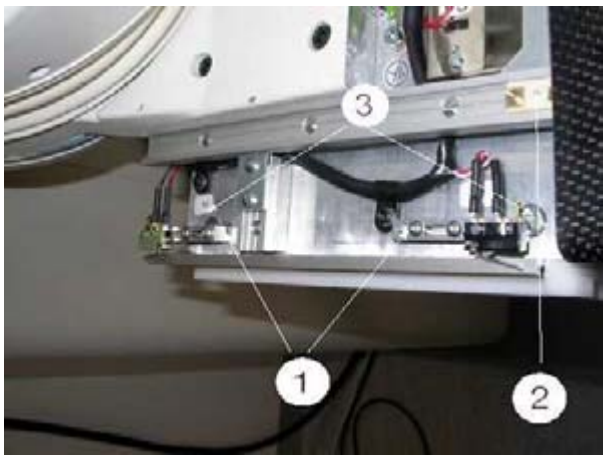

Fig. 4: Remove switches

3. Remove the grid. First, carefully unscrew the two M2 screws on each of the grid holders.
4. Remove the left L-shaped grid holder and then the right; put them in a safe place.
5. The way the grid is held on the two longitudinal sliders ((2/Fig. 4 / p. 14) and (2/Fig. 5 / p. 14)) becomes apparent. Remove the grid and store it in a safe place.

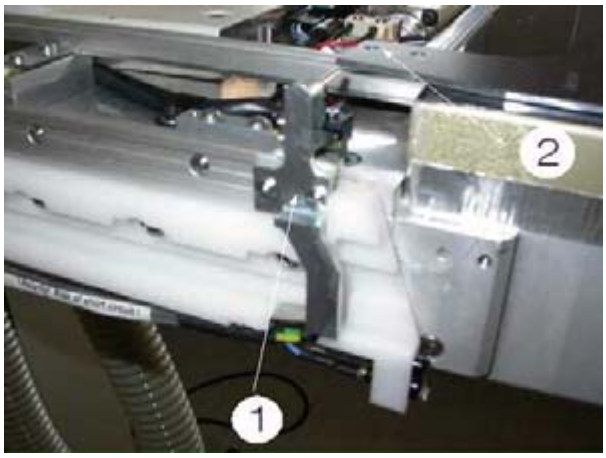

Fig. 5: Remove grid holders

NOTE

When removing the grid, the top of the detector (which is the sliding surface for the grid) is completely unprotected. Handle it with utmost care; you may want to cover this surface with a fine cloth to avoid any damage or scratches. Never use this surface as a tray or a repository.

6. Remove the leads for the magnification cable from connector X 846 on the left side of the detector; remember that the polarity is important. The two leads are color coded; the ground (green-yellow) is the upper connection and the blue lead is down below.

7. Remove the leads from connector X 845 on the right side. The polarity is important. The two leads are color coded; the red cable is on the top and the gray lead is down below.

NOTE	**THE POLARITY OF THESE CONNECTORS (X846/X845) IS IMPORTANT. MAKE SURE THAT THEY ARE CONNECTED CORRECTLY!**

8. Remove the grid sliders on the right and on the left (1/Fig. 5 / p. 14) by sliding them towards the stand out of the Teflon rails.
9. Loosen and unscrew the two screws and remove the right transversal (lateral) grid slider (1/Fig. 6 / p. 15). This is necessary to be able to maneuver the main cable connector out from under the right longitudinal rail. This allows the detector main cable to be removed easily through the square recess (2/Fig. 6 / p. 15) in the detector carrier plate.
10. Push the connector of the detector main cable out under the right longitudinal rail.
11. First, slightly loosen the four Allen screws that hold the detector in place ((3/Fig. 4 / p. 14) and (3/Fig. 6 / p. 15)). Prepare a place to put the detector after removal; be careful not to drop the detector.

Fig. 6: Remove detector

12. Unscrew and remove the four Allen screws and remove the detector.

This concludes the disassembly and removal of the detector.

Installing the new detector

The mechanical installation of the **new** detector should be performed according to the **Installation Instructions** or **Startup manual**, available in the technical documentation folder delivered to the site.

For installation information, refer to:

- Chapter 4 - Detector installation of the **System Startup with WH AWS**, or to:
- Chapter 7 - Detector installation of the **Installation Instructions and Start-Up (DROC)**.

whichever is applicable. The instructions for disassembly, properly applied, can also provide some guidance.

Updating the detector-specific files

All files related to the **old** detector must first be archived, then the files related to the **new** detector are uploaded. The procedures for the DROC and for the WH AWS are similar. Actual steps may differ due to differences in the OS and application software.

For a DROC workstation on site:

1. Switch the MAMMOMAT Novation^{DR} system ON.

   First turn on the main power switch to initiate the BRICK startup.

   After **5 minutes**, turn on the control console.

   After an additional **3 minutes**, turn on the workstation.

2. **There is no special procedure for turning the system off**. Log in as **root** and enter the appropriate password.

3. On the desktop, open File Manager and select the following directory:

   /opt/linx_mp/opt/DRUL_0.6.3/data

   It is recommended that the detector-specific files of the detectors used on each MAMMOMAT Novation^{DR} system be kept on the hard disk of the workstation. **Before** uploading the detector-specific files of the **new** detector from the CD-ROM to the workstation, the files for the removed detector must be stored. Use the following procedure:

4. In the **/opt/linx_mp/opt/DRUL_0.6.3/data** directory, create a new subdirectory with the name: **MPwxyz** , where **wxyz** are the four digits of the serial number of the removed detector.

5. Locate the detector-specific files within this directory **/opt/linx_mp/opt/DRUL_0.6.3/data** - they are:

   MPwxyz.cal

   MPwxyz.cfg

   MPwxyz.map

   MPwxyz.smj

6. Select (highlight) and cut these files from the directory **/opt/linx_mp/opt/DRUL_0.6.3/data** and paste them into the newly created subdirectory **MPwxyz**.

7. Open a second File Manager.

8. Insert the supplied CD-ROM into the compact disk drive of the workstation.

9. Open the directory on the CD-ROM and locate the three detector-specific files for the **new** detector:

   MPabcd.cfg

   MPabcd_final.map

   MPabcd.smj

   There should be three files. The **.cal** file is not present. It is first generated on the MAMMOMAT Novation^{DR} system during one of the following work steps, i.e., the detector gain calibration.

10. Copy these three detector-specific files from the CD-ROM into the directory **/opt/linx_mp/opt/DRUL_0.6.3/data.**

11. Rename **MPabcd_final.map** to **MPabcd.map**.

    In File Manager, simply click the file name and change it from **MPabcd_final.map** to **MPabcd.map**.

12. The **MP** in the file names must be in upper case letters. The file names on older CDs were in lower case letters only. You must rename such files to e.g. **MPabcd.cfg, MPabcd.map** and **MPabcd.smj**. In File Manager, click the file name and replace the lower case **mp** with the upper case **MP**.

    Repeat the procedure for each file, so that all contain an upper case **MP**. Select (highlight) and rename all three files.

13. For each file, select **File -> Properties** and assign it **write** permission.
14. Close File Manager with **exit**.
15. Close all desktop windows.
16. Reboot the entire system.
17. In the log-in window, log in as **apps** and enter the appropriate password.
18. Verify that the code **dr** appears on the MAMMOMAT Novation^{DR} console, which indicates that "digital radiography" mode is ready.

For WH AWS (syngo) on site:

1. Switch the MAMMOMAT Novation^{DR} system **ON**.

   First turn on the main power switch to initiate the BRICK startup.

   After **5 minutes**, turn on the control console.

   After an additional **3 minutes**, turn on the workstation.

2. On the desktop, you need to open/start **Windows Explorer**. To do so, first open the syngo service software by selecting **Options > Service > Local Service** in the window menu header.
3. Then select **Utilities > Escape to OS**.
4. Enter the following command:

   start explorer

   A Windows XP Explorer window opens.

5. On the C: partition, select the directory:

   C:\aws\drul\data

   It is recommended that the detector-specific files of the detectors used on each MAMMOMAT Novation^{DR} system be kept on the hard disk of the workstation. **Before** uploading the detector-specific files of the **new** detector from the CD-ROM to the workstation, the files for the removed detector must be stored.

6. In the directory **C:\aws\drul\data**, create a new (sub)directory named: **MPwxyz** , where **wxyz** are the four digits of the serial number of the **old** detector.

7. Locate the detector-specific files in the directory **C:\aws\drul\data** - they are:

   MPwxyz.cal

   MPwxyz.cfg

   MPwxyz.map

   MPwxyz.smj

   qualify.log

8. Select (highlight) and cut these files from the directory **C:\aws\drul\data** and paste them into the newly created subdirectory **MPwxyz**. (or copy the 4 files from the directory **C:\aws\drul\data**, paste them into subdirectory **MPwxyz**, and then delete them from **C:\aws\drul\data**.)
9. Insert the supplied CD-ROM into the compact disk drive of the workstation.
10. Open the directory on the CD-ROM and locate the three detector-specific files for the **new** detector:

    mpabcd.cfg

    mpabcd_final.map

    mpabcd.smj

    There should be three files. The **.cal** file is not present. It is first generated on the MAMMOMAT Novation^{DR} system during one of the following work steps, i.e., the detector gain calibration.

11. Copy these three detector-specific files from the CD-ROM into **C:\aws\drul\data** using drag and drop.
12. Rename **MPabcd_final.map** to **MPabcd.map**.

    In File Manager, simply click the file name and change it from **MPabcd_final.map** to **MPabcd.map**.

13. The **MP** in the file names must be in upper case letters. The file names on older CDs were in lower case letters only. You must rename such files to e.g. **MPabcd.cfg, MPabcd.map** and **MPabcd.smj**. In File Manager, click the file name and replace the lower case **mp** with the upper case **MP**.

    Repeat the procedure for each file, so that all contain an upper case **MP**. Select (highlight) and rename all three files.

14. Leave Windows Explorer with **exit**.
15. Restart the syngo application by going to **Utilities** in the service software and selecting **Source > System**.

    Utilities > System > Restart Application

    Select **Restart Application** and press **Go** to restart the syngo application.

16. When finished, verify that the code **dr** appears on the MAMMOMAT Novation^{DR} console, which indicates that "digital radiography" mode is ready.

The detector-specific files have been installed.

Checks, adjustments and calibrations

Since the detector has been replaced, some checks must be performed because the mechanical correlation of the tube, collimator and the detector may have changed.

The procedures vary depending on the workstation installed.

- **Collimator check**
  - DROC workstation

    Perform checks as instructed in the **Collimator Adjustments** chapter of the appropriate **Installation Instructions**.
  - WH AWS (syngo)

    Perform checks as instructed in the **Collimator Adjustments** chapter of the appropriate **Startup** instructions.
- **Grid line check**
  - DROC workstation

    Checks must be performed according to the **Checking Grid Lines** chapter of the appropriate **Installation Instructions**.
  - WH AWS (syngo)

    Checks must be performed according to the **Image Quality / Checking grid lines** chapter of the appropriate **Startup** instructions.
- **System calibration**
  - DROC workstation

    Checks must be performed according to the **Image Quality** chapter of the appropriate **Installation Instructions**.
  - WH AWS (syngo)

    Checks must be performed according to the **Image Quality / Checking Image Quality** chapter of the appropriate **Startup** instructions.
- **AEC calibration**

  The full AEC calibration must be performed, including the Dark Offset calibration.
  - DROC workstation

    Checks must be performed according to the **Appendix / AEC Calibration** chapter of the corresponding **Installation Instructions**.
  - WH AWS (syngo)

    Checks must be performed according to the **AEC Calibration Tool** chapter of the appropriate **Software** manual.
- **"H" and "D" dose adjustments**
  - DROC workstation

    Checks must be performed according to the **Checking Dose Settings / Checking the AEC Dose settings** chapter of the appropriate **Installation Instructions**.
  - WH AWS (syngo)

    Checks must be performed according to the **Checking Dose Settings / Checking the AEC Dose settings** chapter of the corresponding **Startup** instructions.

- **QC test**

  The following Quality Control Manual tests have to be carried out:

- Chest wall missed tissue	(No: 10)
- Collimator assessment	(No: 1)
- Compression plate overlap on the chest wall side	(No: 11)
- Phantom image quality	(No: 18)
- Detector uniformity	(No: 14)
- Mean glandular dose	(No: 17)
- AEC Image stability and reproducibility, signal-to-noise ratio	(No: 7)
- Ghost image evaluation	(No: 20)
- AEC testing / AEC Thickness Tracking Test	(No: 5)

  The numbers of the above-listed tests were taken from the QC-M (for DROC, excluding USA). Since the instructions for use and the QC manuals differ not only by workstation, but also reflect rules and regulations specific to the USA and other countries, the CSE must explicitly follow the documentation on site.

Record the related results in the Quality Control Manual Protocol and file it with the system.

Final work steps

Perform a test exposure with the collimator-mounted phantom. When the system is functioning properly, turn it over to the customer.

Replacing the PXCM (BRICK)

General

These instructions describe how to disassemble the PXCM (BRICK) component and mount a new one. It then describes how to perform subsequent required tasks, mainly checks of several adjustments.

If a BRICK has to be replaced, the spare part material number **066 46 728** (with the REP-status) must be ordered.

When describing various tasks, these instructions address the differences between the two workstations (WH AWS and DROC).

Documents required

The type of documentation depends on the acquisition workstation in use:

- **DROC**
  - Installation Instructions and Startup (DROC)
  - Quality Control manual (DROC)
- **WH AWS**
  - Startup, WH AWS VAXXX (XXX - Depends on the installed software version)
  - Software, WH AWS VAXXX (XXX - Depends on the installed software version)
  - Quality Control manual (WH AWS)

Tools and test equipment required

- Drill with a 5.5 mm drill bit
- Dosimeter for mammography
- Power ground-wire tester
- 24 x 30 compression plate
- 3x 20 mm plexi (PMMA) phantom
- Plexi phantom 42x350x350mm
- Alu sheets 1x0.1 + 2x0.2 + 1x0.5 (8881273)

Establishing a connection to the BRICK

There are two software interfaces available on the BRICK, the web-based interface and the command line interface.

Establishing a connection to the BRICK web interface

To access the web-based BRICK interface, start a web browser on the acquisition workstation and enter the appropriate URL.

The procedures differ for opening the BRICK Web home page on a syngo-based acquisition workstation (WH AWS) and a DROC acquisition workstation.

To end the BRICK web interface session, close the web browser window.

- **syngo-based acquisition workstation (WH AWS)**

  Log on to the service software. Select **Options-> Service> Local service**. Enter the service key (6 characters in the 2nd field) in the syngo software screen. Confirm the screen with OK. Select **Acquisition system**. Select **Brick configuration**.

  The BRICK home page opens in a new Internet Explorer window.

- **DROC acquisition workstation**

  Click the Netscape web browser icon on the acquisition workstation and enter the following URL:

  http://brick

  The PXCM home page opens in the web-browser window.

Any time a user attempts to use a function assigned a moderate or high security level, a login prompt is displayed to verify that he or she is authorized to use the function.

The user name and appropriate password have to be entered:

login: root

password: ******

Once you have logged into a particular function, you can use it throughout the same PXCM web tool session. You do not have to log into that function again.

Establishing a connection to the BRICK command line interface

To access the command line BRICK interface, start a telnet session on the acquisition workstation.

The procedures differ for opening the **BRICK command line interface** on the syngo-based acquisition workstation (WH AWS) and the DROC acquisition workstation.

The BRICK command line interface session can be closed by pressing **Ctrl** and **C** simultaneously.

⚠CAUTION **It is very important to spell the command properly when typing it in.**

➪ **If an incorrect command is entered, the BRICK may suffer damage which can be very difficult to remedy.**

- **syngo-based acquisition workstation (WH AWS)**
  - Enter the following command in the syngo Service Software **Utilities -> Escape To OS** command line:

    start telnet brick

    A command tool opens with the UNIX login.
  - The user name and appropriate password have to be entered:

    login: root

    password: ******

- **DROC acquisition workstation**

  Open a Terminal window; either click the **Terminal** icon on the desktop or right-click the desktop background, select **Tools** and then **Terminal** on the drop-down menu.

  - In the Terminal window, enter:

    telnet brick

    The BRICK login id displayed.
  - Enter the user name (root) and the appropriate password.

    login: root

    password: ****

Procedure and work steps

Note the system-specific values

1. Log into the BRICK web interface; see "Establishing a connection to the BRICK web interface" on (Establishing a connection to the BRICK / p. 21).

2. To view the BRICK AEC configuration information, click the **Brick AEC Configuration** link on the BRICK Control Panel page or the **AEC** link on any of the other PXCM pages. The **Brick AEC - Status** page is displayed, as shown in (Fig. 7 / p. 24).

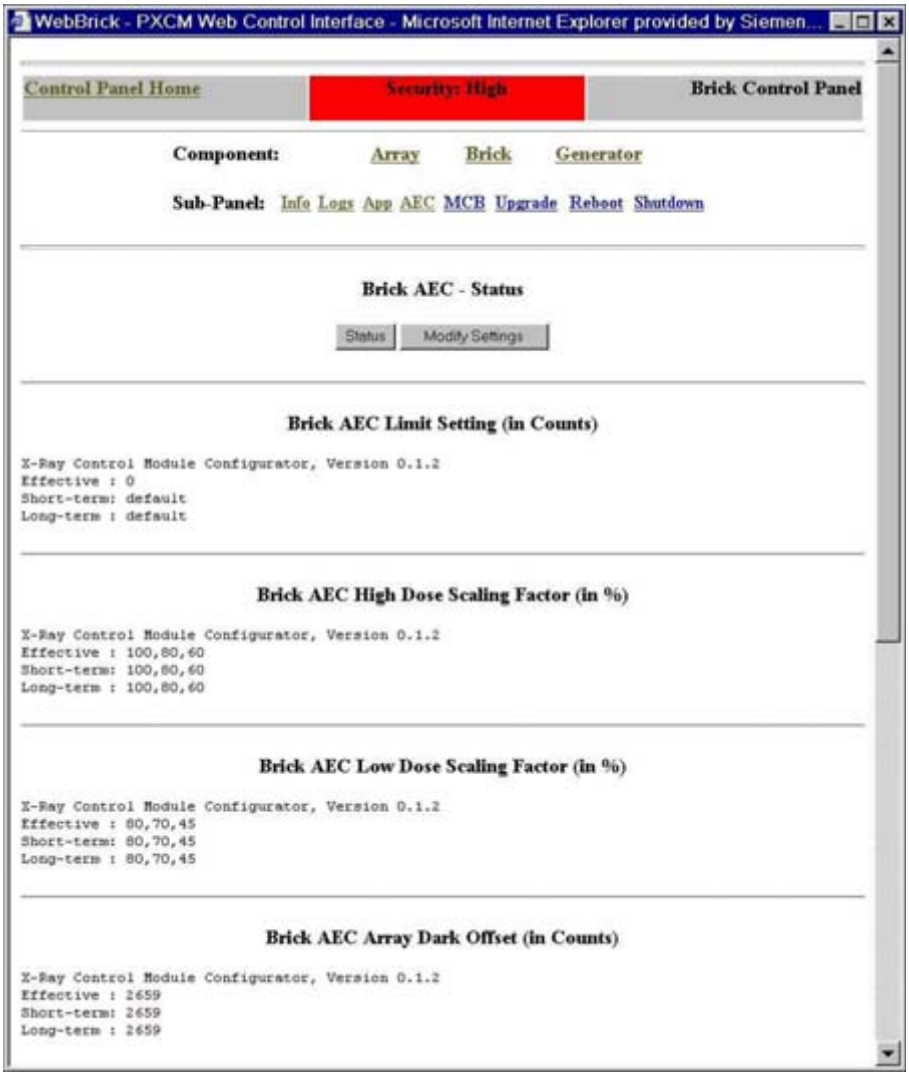

Fig. 7: BRICK status

3. Note the corresponding **effective** values in (Tab. 1 / p. 24).

Tab. 1 BRICK values

Item	Value
Brick AEC High Dose Scaling Factor	
Brick AEC Low Dose Scaling Factor	

Dismount the BRICK

- Turn OFF the entire system by switching **OFF** the mains input switch **S700**.
- Remove the service cover at the back of the MAMMOMAT.
- Remove all connectors and cables from the BRICK.
- Remove the BRICK. Be aware of the weight of the BRICK and exercise appropriate caution.

Mount the new BRICK

- Depending on the manufacturing level, the front holes of the BRICK have to be enlarged. Try to fit the screw through the front holes. If they do not fit, enlarge the holes with a 5.5 mm drill bit.
- Mount the BRICK.
- Connect all cables and connectors.

Start up the system

1. Switch the external main power switch in the room **ON**.
2. Verify that the generator and BRICK power up properly.
3. Verify that the communication between the BRICK and the acquisition workstation is working properly (LEDs V2 and V3 on the BRICK must be green). The PXCM includes three status LEDs:

   V1 Fiber-optic communications status. A red LED that lights to indicate lack of communication from the DROC. Likely causes are misconnected fiber optic lines or the detector being turned off.

   V2-PXCM status A green LED that flashes to indicate normal operation of the PXCM. If this LED does not light for a significant amount of time (that is, 2 to 3 minutes), restart the system.

   V3-Power status A green LED that lights to indicate that the PXCM is providing power to the detector.
4. Press the power **ON** button on the control console to activate the MAMMOMAT Novation^{DR}. The internal monitoring system automatically performs a functional check of the MAMMOMAT Novation^{DR}. When the detector wing is selected, **dr** is displayed on the film density display of the control panel to indicate that communication with the MAMMOMAT Novation^{DR} system is functioning.
5. Wait approximately **2 - 5 minutes**.
6. Switch the PC and the screen **ON** at the acquisition workstation.

Entering the BRICK values

1. Establish a connection to the BRICK via the **web interface**; see "Establishing a connection to the BRICK web interface" on page 3 - 1
2. Select **Brick**, or the **AEC** link on any of the other PXCM pages, and then select **Brick AEC Configuration**.

3. Select **Modify settings**.

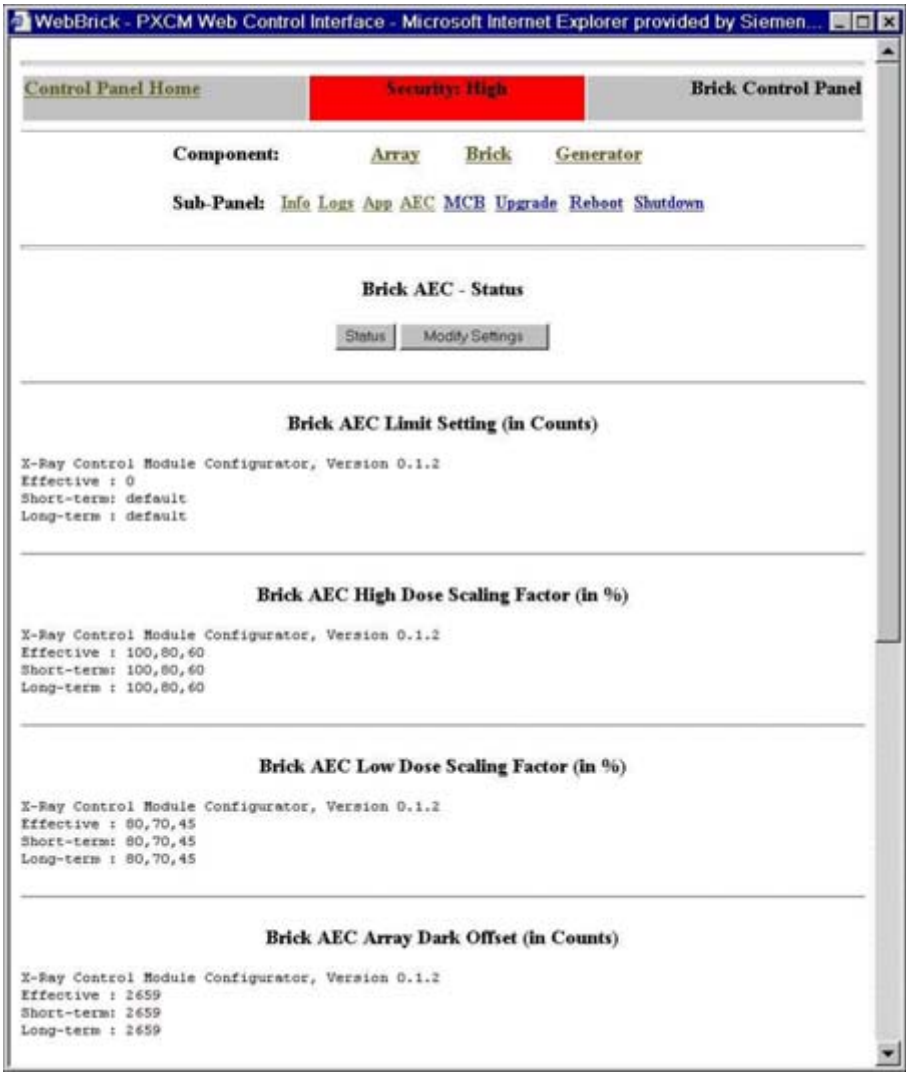

Fig. 8: BRICK - Modify settings

4. Enter the values from (Tab. 1 / p. 24).

   An example for entering the value under **Modify low dose scaling** is shown.

   Scroll down to **Modify low dose scaling**.

   - select **save** in the **Duration of Change** drop-down menu and

   - enter the values in the **Low Dose Scaling Value** field and click **Change Low Dose Scaling** to save it.

   Make sure the values are separated by commas, e.g. **80,70,45**.

5. Set the **Brick AEC Array Dark Offset** and the **Brick AEC Array Mag Offset** to the value **0**.

Setting the time zone

1. Select **Brick -> Time zone**.

   The current time zone is listed on the left of the screen.

NOTE

The "time zone" link has been added in revision 05 (software version 1.2.6.0).

If you have an earlier revision, you cannot set the time zone. The BRICK will work fine regardless.

2. Click **Modify Settings** to change the time zone setting.
3. Enter the new string in the **New Time Zone Value** dialog box and click **Change time zones** to save the new setting.
4. Go back to the BRICK home page.

Setting the xrayconfig timeout

1. Establish a connection to the BRICK via the **command line interface**; see "Establishing a connection to the BRICK command line interface" on page 3 - 2
2. Enter the command:

   brick# **xrayconfig host_timeouts save 1000**

Setting the date, time

1. To check the current date and time setting on the BRICK, use the following command:

   brick# **date**

   To set the date and time on the BRICK, use the following command:

   brick# **date mmddHHMMyy**

   mm - month

   dd - day

   HH - hours

   MM - minutes

   yy - year

   The following example sets the system to 3:10 p.m. on November 21, 2004:

   brick# **date 1121031004**

Rebooting

1. Reboot the BRICK by entering the command:

   brick# **reboot**

   Wait approximately **5 minutes** for the reboot to complete. Check that all BRICK LEDs are working; see "Start up the system" on page 3 - 5.

Performing the AEC calibration

The manual you use depends on which acquisition workstation you are using.

- **DROC:** Installation Instructions and Startup (DROC) (Chapter: 'Appendix / AEC Calibration')
- **WH AWS:** Software, WH AWS VAXXX (Chapter: 'AEC Calibration Tool')

NOTE

The 'Dark Offset' measurements can be skipped, since the 'Brick AEC Array Dark Offset' and the 'Brick AEC Array Mag Offset' values have to be set to '0'.

NOTE

The AEC calibration can be shortened if you know the 'mAs' value to be used for the 'goal table'.

You should find the 'mAs' value in the technical binder in the 'Prüfprotokoll' (test protocol).

If you know the 'mAs' value, you can skip the 'Half Value Layer - HVL' and 'Entrance Skin Exposure - ESE' measurements and start directly with 'Generating the goal tables'.

Performing the gain calibration

Perform the gain calibration as instructed in the following documentation:

- **DROC:** Installation Instructions and Startup (DROC) (Chapter: 'Image Quality / Detector Calibration')
- **WH AWS:** Startup, with WH AWS (Chapter: 'Image Quality / Check Image Quality / Calibration of detector')

Checking the AEC dose values

The manual you use depends on which acquisition workstation you are using.

- **DROC:** Installation Instructions and Startup (DROC) (Chapter: 'Checking the AEC dose settings')
- **WH AWS:** Startup, with WH AWS (Chapter: 'Checking the AEC dose settings')

Performing the QC tests

1. Test 12: 'Mean glandular dose'
2. Test 16: 'AEC testing'

Final procedures

1. Mount the service cover on the back of the MAMMOMAT.
2. Check the protective ground resistance.

Replacing the compression unit

General

These instructions describe the work steps for replacing the compression unit and for calibrating this unit.

The procedure should be used also in cases when the compression unit has been calibrated.

Required documents

Software System Stand, SPB7-250.816.03....

QC manual

Tools

Standard tool kit

Dynamometer or scale with a digital display

Service PC

Disassembling the compression unit

- Turn the system **OFF**.
- Remove the covers from the swivel arm.
- Disconnect connectors X 872, X 873,X874 and X831 from board D805.
- Remove the bolts holding the compression unit.
- The compression unit can be dismounted carefully from the holder.

Compression unit assembly

- Install the compression unit in the reverse order of disassembly.
- Plug connectors X872,X873,X874 and X831 into board D805.
- Insert the three bolts and tighten them slightly (1/Fig. 9 / p. 30).
- Secure the cables with cable ties.

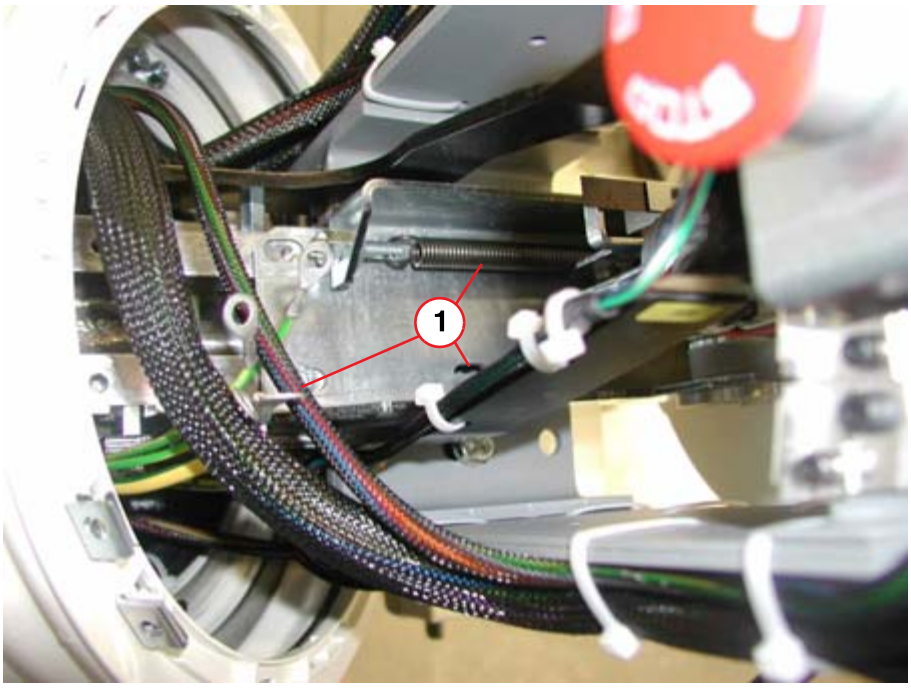

Fig. 9: Fixing bolts

NOTE

Ensure that the compression unit is installed in the correct mechanical position. Use phantom images to check the unit's position after adjustment.

NOTE

When positioning the exchange compression unit, make sure that the two shrunk-on insulating hoses attached to the backside of the electromotor do not become entangled in the upper part of the arc (or dome, also called “church”). The electromotor has to move freely under that arc. Several manual checks are necessary (1/Fig. 10 / p. 31).

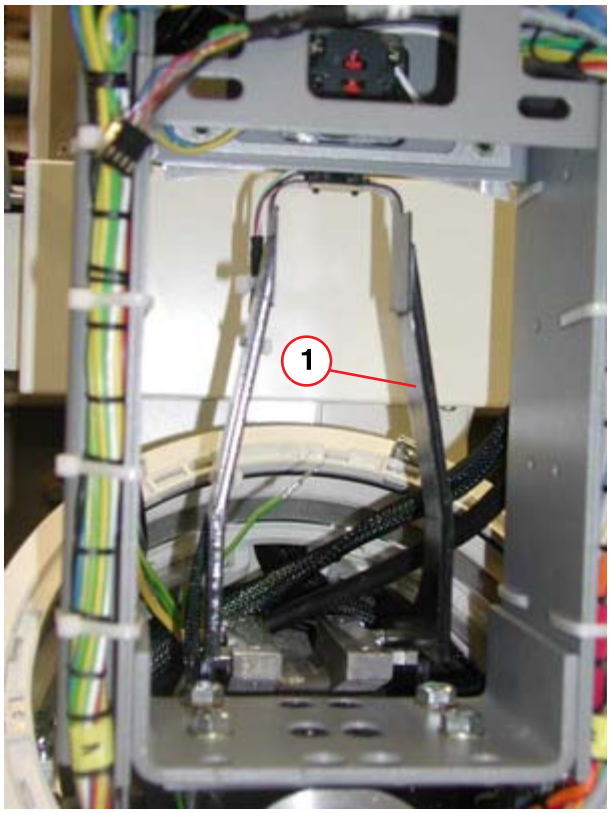

Fig. 10: Church

- Insert the compression plate into the compression unit. Manually move the compression plate downward toward the detector. It is important for the front edge of the compression plate to be parallel to the carbon-fiber plate edge.
- Manually move the compression plate upward. There must be 285 mm between the carbon-fiber plate edge and the metal sheet under the guide for the compression plate holder (Fig. 11 / p. 32).
- Securely tighten the three bolts for the compression unit holder (1/Fig. 9 / p. 30).

NOTE

This document describes an initial calibration. Therefore, it describes cases in which a Mammomat system is equipped with a newly mounted compression unit, and therefore either the relevant data from another (e.g. the formerly mounted) compression unit stored in the system or no meaningful compression calibration data stored in the system.

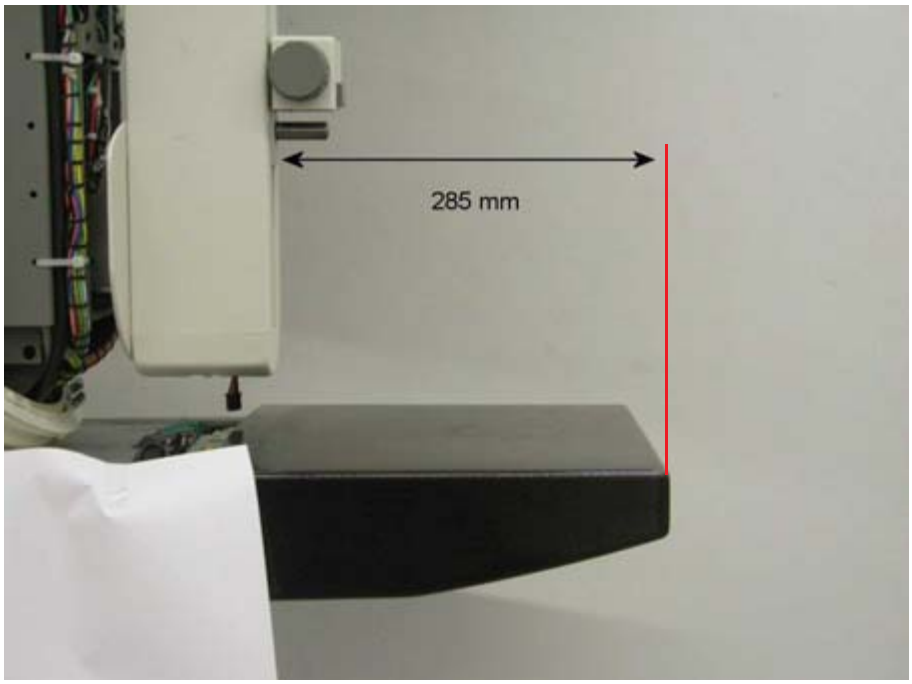

Fig. 11: Distance

Calibrating the compression unit

Connect the service PC according to Documentation Software System Stand, SPB7-250.816.03…

Start the service program.

In the main menu, under **Configuration -> Compression**, select **Optimized compression**. If you find the number/value 5137 in any of the (two) OPCOMP data fields shown in the appearing mask, change it to some other arbitrary number. If the value in those data fields differs from 5137, press F2 (save).

In the main menu, under **Configuration ->Compression**, select **Optimized compression dr** and repeat the procedure described above.

Prior to calibration, the following values must be entered in the system as **default values**.

Force = 0 kp	0066
Force = 20 kp	02D8
Preset force 3 kp	06
Preset force 20 kp	FF
Thickness bottom	0093
Thickness bottom	0
Thickness top	037E
Thickness top	180

- Move the swivel arm into the upright position, i.e., the vertical angle equals zero degrees (0°). This will be the position in which all following calibration steps will be performed.
- Select Calibration in the main menu, under **Configuration > Compression**.

Calibrating preset force 3 kp

- Position the cursor in the data field of the reset force 3 kp row with the help of the tabulator, i.e. “TAB key” on the keyboard. Turn the potentiometer F max. for preset force on the front top of the compression unit as far in the counter-clockwise direction as possible (until its mechanical stop).
- Press F3 (calibrate), then press F4 (update). The unit should now have stored the sampled value (in hexadecimals), corresponding to the minimum possible preset force of 3kp .

Calibrating preset force 20 kp

- Position the cursor in the data field of the preset force 20 kp row with the help of the “TAB key” on the keyboard. Turn the potentiometer F max. for the preset force on the front top of the compression unit as far in the clockwise direction as possible (until its other mechanical stop).
- Press F3 (calibrate), then press F4 (update). The unit should now have stored the sampled value (in hexadecimals), corresponding to the maximum possible preset force of 20 kp .

NOTE **The potentiometer F max. for the preset force should remain at maximum throughout the entire calibration.**

Calibrating the thickness bottom

When the thickness bottom is calibrated, no compression plate should be attached to the compression unit. Move the sled of the compression unit to its lowest position by means of the foot switch.

- Move the cursor to the data field for thickness bottom. The actual position of the two-digit cursor in the four-digit data field is of no importance.
- Press F3 (calibrate), then press F4 (update).

Calibrating the thickness bottom mm

- Move the cursor to the data field for thickness bottom mm.
- Use the PC keyboard to enter the value 0 (zero) in the data field.

Calibrating the thickness top

- Move the cursor to the data field for thickness top. The actual position of the two-digit cursor in the four-digit data field is of no importance.
- Move the sled of the compression unit to its highest position by means of the foot switch.
- Press F3 (calibrate), then press F4 (update).

Calibrating the thickness top mm

Attach a compression plate to the compression unit. Do not use the compression plate with the “flex” paddle for this work step. Use the compression plate with a regular paddle (recommended size: 18 x 24cm). This same compression plate has to be used for the final check of the compression after all the calibration steps have been performed. The object table (e.g. 18 x 24 cm) has to be mounted on the base plate.

- Position the cursor in the data field for thickness top mm.
- Move the vertical sled of the compression unit to its highest position by means of the foot switch. Use the hand wheel when the drive stops to ensure that the sled reaches its upper mechanical limit position.
- Measure the distance from the top of the carbon-fiber cover of the object table to the bottom of the paddle of the compression plate, e.g. by means of a tape measure. Enter the data measured in millimeters (mm) in the corresponding data field.

Calibrating force = 0 kp

NOTE

The sled is still in its highest position. The regular compression plate 18 x 24 cm used for the previous calibration step is still attached to the compression unit. These are the correct prerequisites for the following calibration step. In order to eliminate the tolerances of the gear within the compression unit, it is important to move the sled down approximately 5 cm by means of the foot-switch. Do not use the hand wheel in this step! Proceed as follows:

- Position the cursor in the data field of the force = 0 kp row with the help of the “TAB key” on the keyboard. The actual position of the two-digit cursor in the four-digit data field is of no importance.
- Activate the foot-switch to move the compression plate downward approximately 5 cm.
- Press F3 (calibrate), then press F4 (update).

Calibrating force = 20 kp

- Move the compression plate to its highest position.
- The compression plate used in previous step remains attached to the compression unit.
- Position the cursor in the data field of the force = 20 kp row with the help of the “TAB key” on the keyboard. The data field should contain the default hexadecimal value “02D8”. First perform a cross-check and then use the keyboards to make any necessary corrections.
- Place a suitable dynamometer, e.g. a very good quality scale with a digital display (having a measuring tolerance possibly lower than 100 pond/gram), onto the object table. Protect both the carbon-fiber cover of the object table and the plexi of the compression paddle with a cloth or towel against damage from the used scale.
- Move the drive downward from the compression plate via the foot switch. Never use the hand wheel during this measurement! The paddle will move and reach the scales. Hold the foot-switch steady. The paddle will compress the scales. Release the foot-switch only when the compression force, i.e. its value displayed on the scales, no longer changes. Wait approximately 10 to 15 seconds in order to allow the setup to stabilize before reading the measured value.

- Repeat the measurement once/twice if the scales show a value exceeding the prescribed tolerance +/- 0.3 kp of the nominal 20 kp. To do this, decompress by about 50 N via the other foot-switch and then compress again.
- If the (average) force shown on the scales doesn't fall into the given range, the hexadecimal value for force = 200 N stored in the data field has to be adjusted.

  (This is only an approximation, meant as an example; please observe the actual behavior: decreasing the default value "02D8" by four units (to: 02D4) will result in a force decrease of approximately 2 N. A corresponding increase (to: 02DC) will result in a force increase of approximately 2 N.)
- Adjust the hexadecimal value and save it by pressing F2.
- When the adjusted value is saved (under calibration), cross-check the force as described above. Adjust the hexadecimal value, if necessary. Perform another cross-check.
- Save the final value by pressing F2. This should exit the menu (otherwise press ESC).

Optimized compression

- Select Optimized Compression in the main menu, under **Configuration > Compression**.
- Re-enter the value "5137" in both OPCOMP data fields, i.e. for OPCOMP 18 x 24 and for OPCOMP 24 x 30.
- Save the entered value by pressing F2.
- Exit the menu by pressing ESC.

Checking the compression unit

Maximal compression – lowest position of the paddle

- Attach the same compression plate used for the work step: "calibrating the thickness top mm" to the compression unit.
- Activate the foot-switch to move the compression plate cautiously downward.
- Check whether the bottom of the paddle has reached the surface of the carbon cover.

Lower endpoint

- First detach and remove the compression plate from the unit.
- Attempt further downward motion via the foot-switch. Keep the switch pressed until the sled reaches its lowest limit position (mechanical stop).
- Read and record the compression thickness data (in mm) for the lower endpoint, as shown on the stand display.

Upper endpoint

- Move the compression plate upward to its upper endpoint.
- Reattach the compression plate and measure the distance from the top of the carbon-fiber cover of the object table to the bottom of the paddle of the compression plate, e.g. by means of a tape measure. (As for the calibration of "thickness top mm".)
- Read and record the corresponding data shown on the stand display. Compare it to the data just measured.
- Remove the compression paddle.

- Back up the stand values, according to Software Service, print number SPB7-250.816.03.02…

Final steps

- Reinstall the swivel arm covers.
- Take exposures with 2-cm and 6-cm phantoms. Ensure that the edge of the compression plate (paddle) is not visible. Test compression plate recognition. Check whether the compression unit recognizes the compression plates. All compression plates in the compression unit are tested consecutively to determine whether the collimator is collimating to the correct size.
- The **compression plate alignment** and **compression force** tests have to be performed according to the **QC manual**.

Replacing stand boards

General

These instructions describe the work steps for replacing stand boards.

Required documents

Software System Stand, SPB7-250.816.03...

Wiring Diagrams, SPB7-250.844.01...

Tools

Standard tool kit

Service PC

D740 deck board

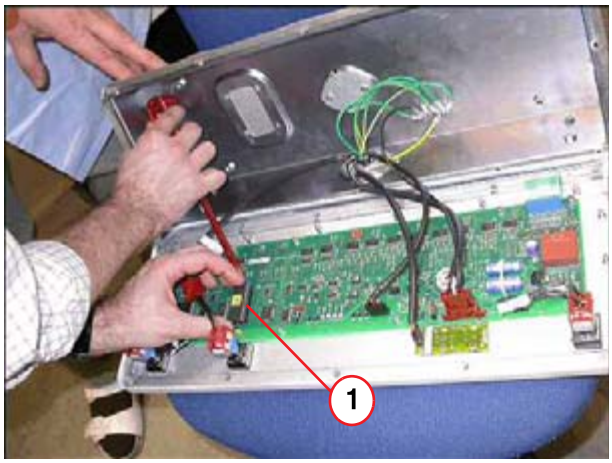

Fig. 12: D740

- Make a backup of the panel data, if possible. See Software System Stand and Back-up/Restore.
- Turn the system **OFF**.
- Remove board 740 from the console desk.
- IC J10… has to be moved from the old to the new board (1/Fig. 12 / p. 37).
- Install new board D740.
- Turn the system **ON**.
- Restore the panel data.

D750 master board for Mammomat Novation

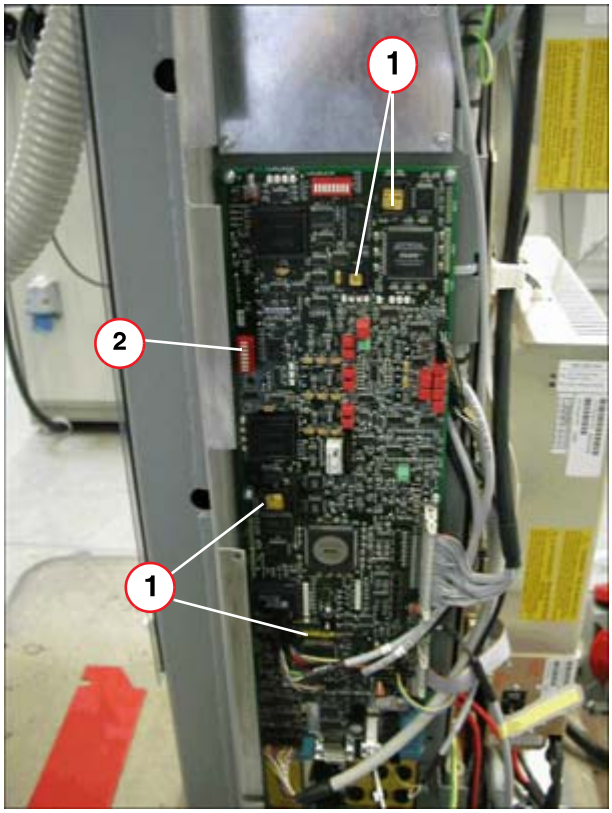

Fig. 13: D750

- Turn the system **OFF**.
- Remove the right stand cover.
- Remove board D750 from the stand.
- IC 45, IC 53, IC 62, IC 52 have to be moved from the old to the new board(1/Fig. 13 / p. 38).
- Check the position of switch S5 and the bridge on …X754 1-2 (2/Fig. 13 / p. 38).
- Install the new board.
- Install the right stand cover.
- Turn the system **ON**.
- No backup/restore or adjustment needed.

D801 stand CPU board

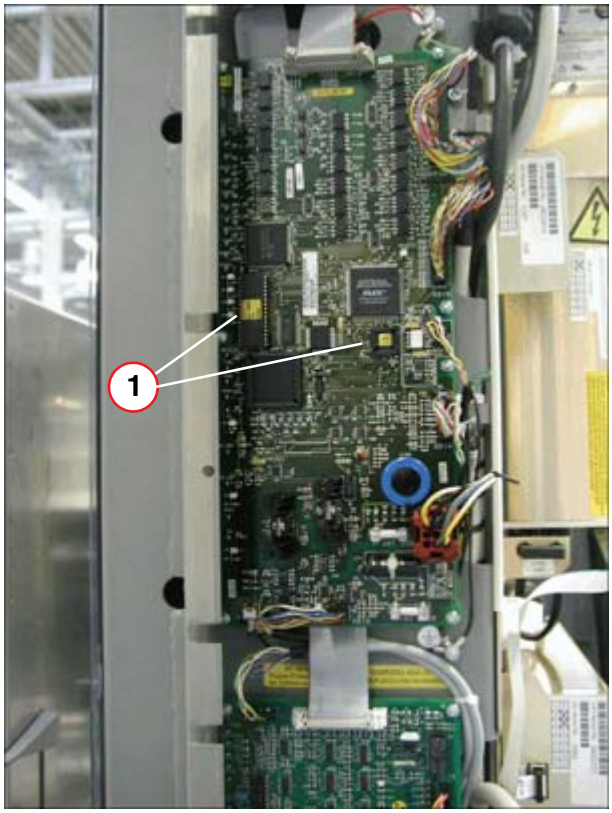

Fig. 14: D801

- Make a backup of the stand data. See Software System Stand and Backup/Restore.
- Turn the system **OFF**.
- Remove the right stand cover.
- Move prom J9 and J65 from the old to the new Board (1/Fig. 14 / p. 39).
- Install the new board.
- Install the right stand cover.
- Turn the system **ON**.
- Restore the stand data.

D802 motor control board

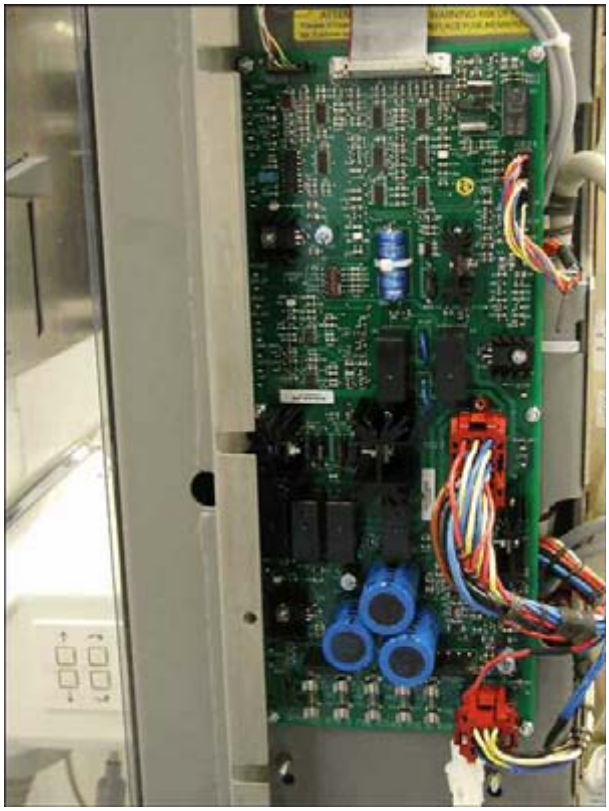

Fig. 15: D802

Only mechanical works needed.

No backup/restore or adjustment is needed.

D805 wing board

Only mechanical works needed.

No backup/restore or adjustment is needed.

D810 tilt switch board

Only mechanical works needed.

No backup/restore or adjustment is needed.

D814 collimator control board

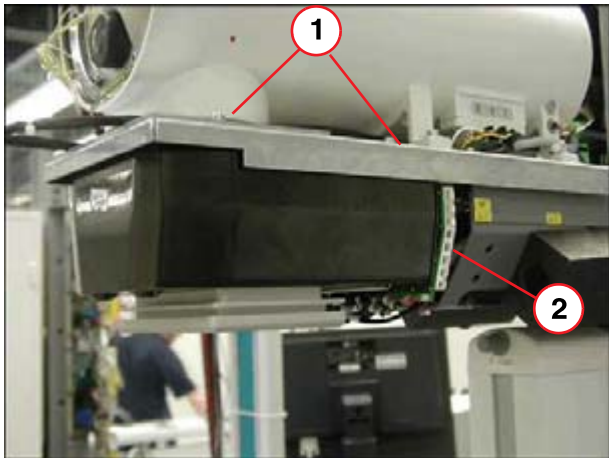

Fig. 16: Tube assembly with collimator

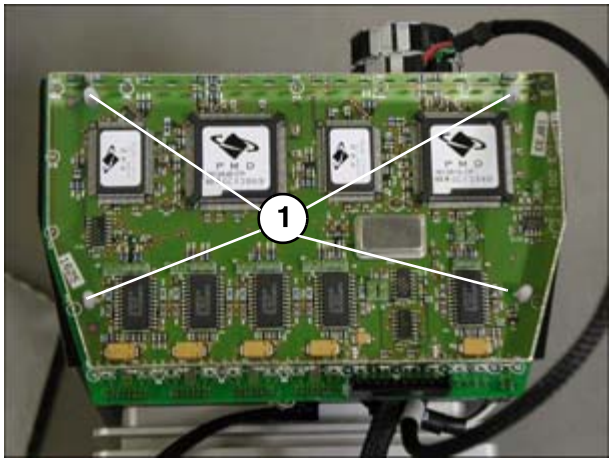

Fig. 17: D814

- For mechanical works, see Replacement of Parts, Collimator.
- After changing D814, the collimator adjustment has to be checked according to **System Startup instructions, SPB7-250.815**....the Collimator Adjustment chapter (Collimator and D814 / p. 42).
- Back up the stand data.

Replacing the collimator and D814

General

These instructions describe the work steps for replacing the collimator and D814.

Required documents

Software System Stand, SPB7-250.816.03....

System Start-up with WSH AWS, SPB7-250.815... for systems with AWS or

Installation Instructions, SPB7-250.812... for systems with DROC

QC Manuals

Tools

Standard tool kit

Service PC

Disassembling the collimator

⚠WARNING

Before you begin working on equipment, it is very important that you disconnect it from the power supply at the main circuit breaker.

➪ **Before removing or inserting any of the printed circuit boards, switch off the equipment.**

⚠WARNING

If the system is only switched off at the control panel, the line voltage will still be present at the generator line connection (see wiring diagram).

➪ **A life-threatening hazard of electric shock exists.**

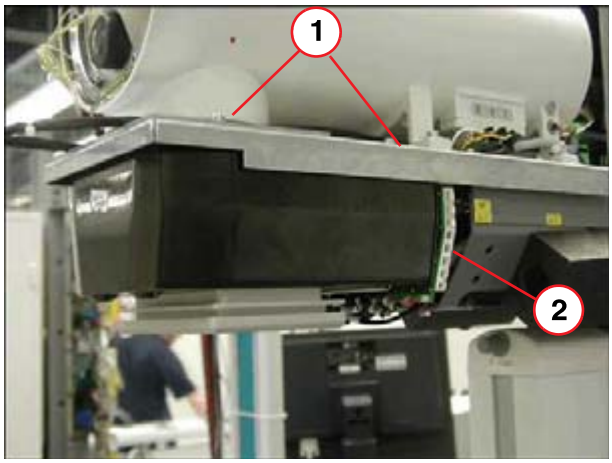

Fig. 18: Tube assembly with collimator

- Turn the system OFF.
- Remove the covers from the swivel arm.

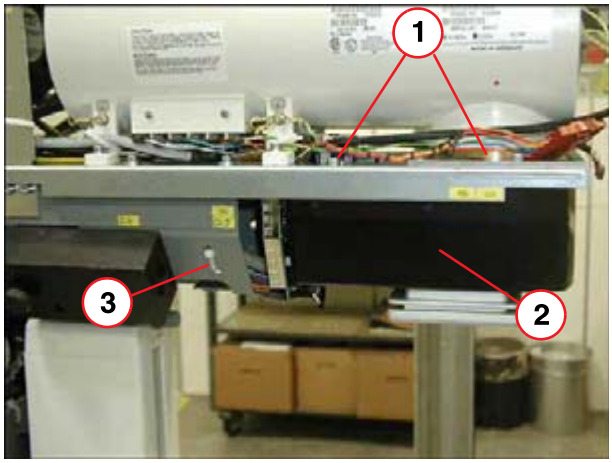

Fig. 19: Tube assembly support

- Cut the cable tie (3/Fig. 19 / p. 43).
- Remove the cables between the collimator and D805. For this, unplug connectors X894/X895 on board D805 and connector X832/X837 on board D814 (Fig. 19 / p. 43).
- Remove the 4 screws M5x14 ((1/Fig. 18 / p. 43) and (1/Fig. 19 / p. 43)). The collimator can be removed from the tube assembly support (Fig. 20 / p. 44).

Disassembling board D814

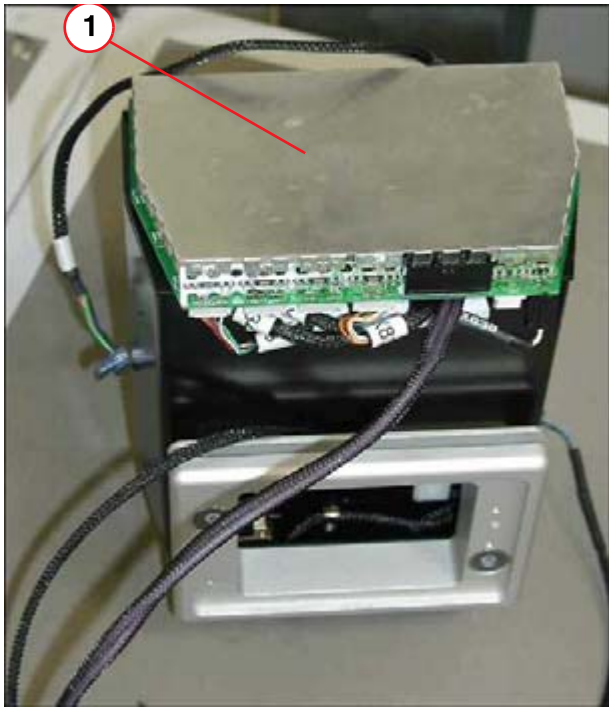

Fig. 20: Collimator

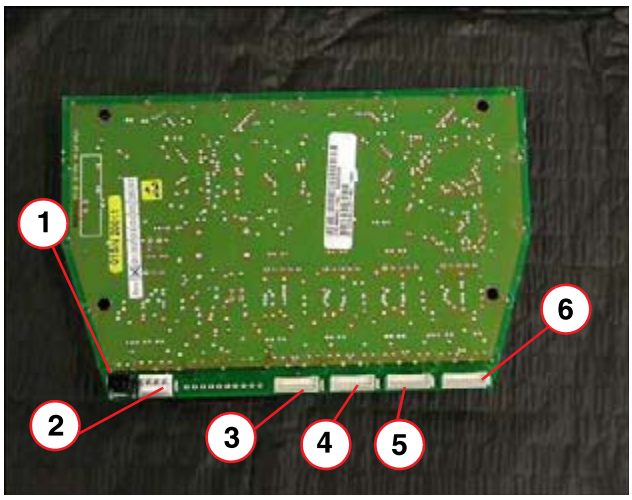

Fig. 21: D814

Pos. 1	X838
Pos. 2	X837
Pos. 3	X836
Pos. 4	X835
Pos. 5	X834
Pos. 6	X833

- Remove the shielding plate from board D184 (1/Fig. 20 / p. 44).
- Loosen connectors X833, X834, X 835, X836 and X838 (Fig. 21 / p. 44).
- Loosen board D814 from the 4 plastic holders (1/Fig. 22 / p. 45).
- Board D814 can be removed from the collimator.

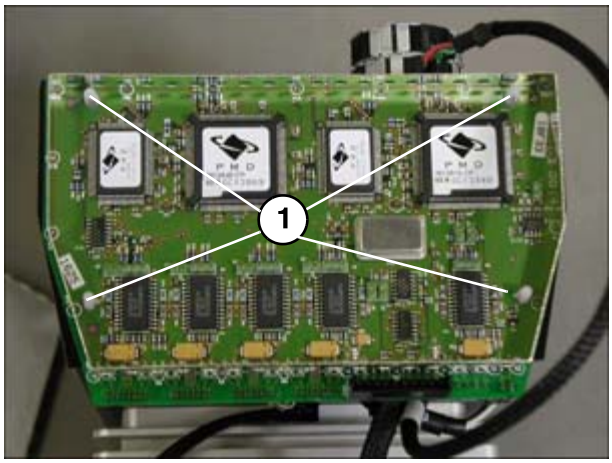

Fig. 22: D814

Assembling board D814

- Plug D814 into the 4 plastic holders (1/Fig. 22 / p. 45).
- Plug connectors X833, X834, X 835, X836 and X838 on D814 (Fig. 21 / p. 44).
- Insert the shielding plate on board D814 (1/Fig. 20 / p. 44).

Mounting the collimator

- Lead the filter motor cable through the hole in the plate.
- Mount the collimator with board D814 on the tube assembly support using the 4 screws M5x14. ((1/Fig. 18 / p. 43) and (1/Fig. 19 / p. 43)).
- Plug connectors X894/X839 into board D805 and X832/X837 into D814.
- Secure the cables via a cable tie. (3/Fig. 19 / p. 43)

Filter offset value

The filter offset value has to be checked after a collimator change. The correct value ensures the correct position of the filter on the collimator.

For this setting perform the following:

- Connect the service PC according to Software System Stand SPB7-250.816.03…
- Start the service program
- Select **Configuration->Filter->Filter offset value**
- The filter offset value has to be between 70 and 90

- **Don’t exit this window**

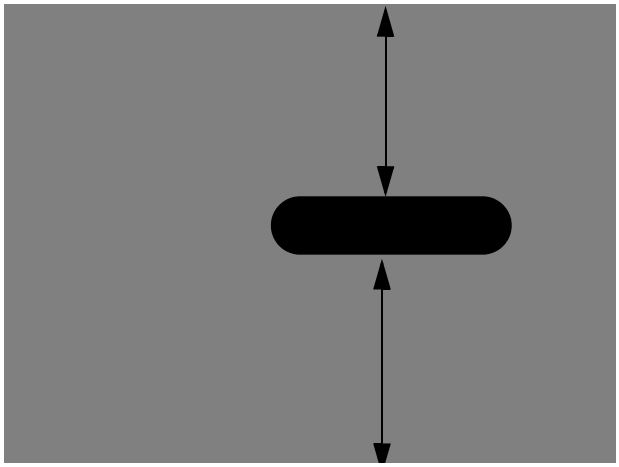

Fig. 23: Image

- Make an exposure using the collimator-mounted phantom, RCC, 28 kV, 5mAs, Mo/Mo. The image shows a “dark shadow” in the center (Fig. 23 / p. 46). The limits (left/right) of this “dark shadow” must be the same distance from the image edges. Increasing the filter offset value moves the “shadow” to the right, and decreasing the filter offset value moves the “shadow” to the left. The difference between both sides should not exceed 2 mm.
- Save the value by pressing F2.
- Close the service program.

After replacing the collimator or board D814, the collimator has to be adjusted. Refer to:

System Start-up, WH AWS, SPB7-250.815…., the Collimator Adjustment chapter, for systems with WH AWS or Installation Instructions and Start-up, SPB7-250.812…, the Collimator Adjustment chapter, for systems with DROC.

Furthermore, the dose settings must be checked using the same instructions.

Replacing the light localizer lamp

If only the light localizer lamp is defective, the lamp can be replaced as follows:

- Switch the system OFF.

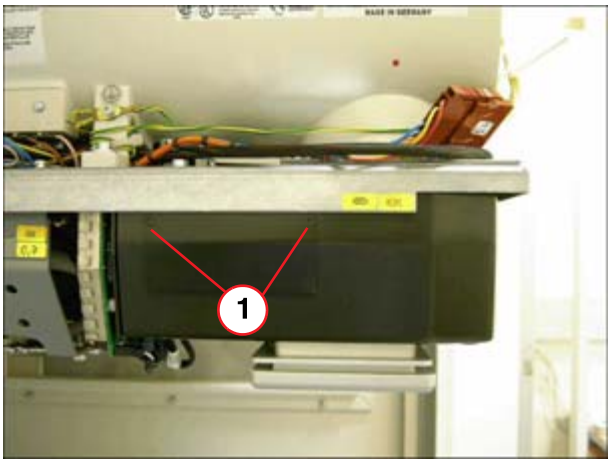

Fig. 24: Collimator

- Remove the two screws (1/Fig. 24 / p. 47)
- Remove the plate
- Remove the two screws (1/Fig. 25 / p. 47)

NOTE	**Be careful not to damage the filter disk.**

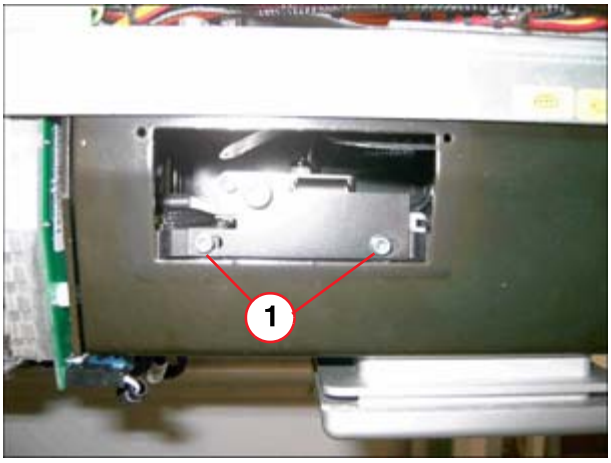

Fig. 25:

- Pull out the lamp holder carefully. Be careful with the lamp power supply cable.

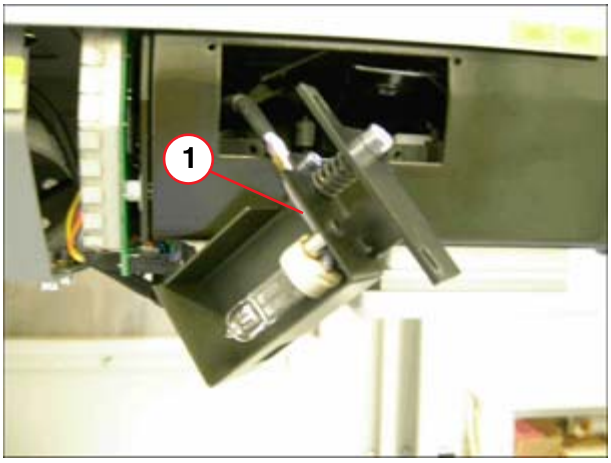

Fig. 26: Lamp holder

- Replace the lamp (1/Fig. 26 / p. 48)

NOTE	**Do not touch the lamp with your fingers. Wear gloves or use a soft cloth when replacing the lamp.**

- Reinstall the lamp holder

NOTE	**Be careful not to damage the filter disk.**

- Reinstall the plate with the screws (1/Fig. 24 / p. 47)
- Make an exposure to check the X-ray/light field
- If necessary, adjust the light field according to System Start-up with WH AWS, SPB7-250.815… the Collimator Adjustment and Collimator Field Light Calibration chapters.

Final steps

- For information on backing up the stand data, see Software System Stand, SPB7-250.816.03…, Adjustment and Service Programs.
- Install the covers of the swivel arm.

- QC tests;

  The following quality control manual tests have to be carried out:

  Collimator assessment

  Beam quality

  AEC security test

  AEC short-term reproducibility

  AEC long-term reproducibility

  Detector uniformity

  Mean glandular dose

  Image quality contrast visibility

Mechanical works and adjusting

General

These instructions describe how to disassemble the grid and mount a new one. It then describes how to perform subsequent required tasks, mainly checks of several adjustments.

Documents

The type of documentation depends on the acquisition workstation in use:

- DROC
  - Installation Instructions and Start-up (DROC)
  - QC Manual (DROC)
- WH AWS
  - Start-up, WH AWS VAXXX(XXX - Depends on the installed software version)
  - Software, WH AWS VAXXX (xxx - Depends on the installed software version)
  - QC Manual (WH AS)

NOTE	**Note: removing the grid requires certain mech. adjustments. After assembling the grid, image quality should be checked according to the instructions Mammomat Novation, System Start-up...,SPB7-250.815…for systems with WH AWS or Mammomat Novation, Installation Instructions… SPB7-250.812…for systems with DROC.**

Disassembling the grid

The disassembly of the grid is described in the instructions **" Replacement of parts" SPB7-250.841**…, Repl.. of the FFDM(Disassembling the old detector / p. 12).

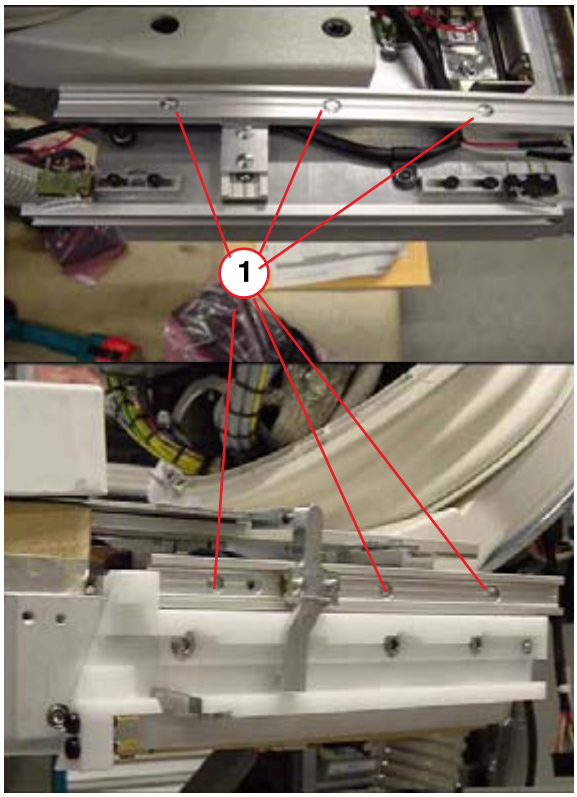

Fig. 27: Grid guide

Some screws are not to be loosened since this is a factory setting and ensures parallel grid movement (1/Fig. 27 / p. 51).

Assembling the grid

The grid should be assembled as described in **System Start-up, SPB7-250.815**.., in the Detector Installation section.

Grid lines

After assembling the grid, the image quality should be checked , i.e. for grid lines. This should be done as described in **System Start-up, SPB7-250.815**... and in the following:

1. Register or create a **Grid lines test** and submit it via **Exam**.
2. Select the **Vendor Proc 1** procedure from the examination tab card.
3. Select the exposure parameters: **28 kV** and **Mo/Mo**.
4. Make sure that a 1:1 view is selected for a better view.

   Select **View** -> 1:1.
5. Make all exposures according to Tab. 1.
6. Activate magnification (**Image -> Magnify by 2.0**) and look for grid lines in the plexi phantom area.
7. Make a not of the results (visible grid lines) in Tab. 1, choose the next image in the list, and start over with step 5 until all images are evaluated. For evaluation, also see the Image Quality chapter of the Start-up Instructions.

Tab. 2 Test 1 protocol

Exposure	Exp. mode	mAs	PMMA/mm	Tube angle	Visible grid lines (Y/N)
1	mAs	32	30	0°	
2	mAs	56	40	0°	
3	mAs	110	50	0°	
4	AEC “H”		40	0°	
5	AEC “H”		40	0°	
6	AEC “H”		40	0°	

If grid lines are visible, check the following adjustments:

Eliminating grid lines

There are various adjustments for eliminating grid line problems:

- Adjusting the "wheel" that is mounted on the grid motor.
- Adjust the grid switch.
- Adjust the grid location.
- Adjust the grid speed.

Adjust the “wheel” that is mounted on the grid motor.

A wheel with slits which activate the grid switch (S1) is mounted on the left side of the grid motor (M1).

1. Move the grid to the left end position.
2. Check if the slits are horizontal to the detector table (Fig. 28 / p. 52).

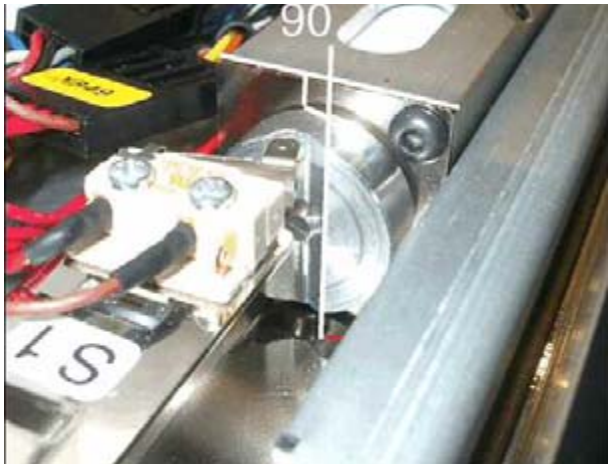

Fig. 28: Adjusting the grid motor wheel

3. Move the grid to the right end position.
4. Check if the slits are horizontal to the detector table (Fig. 28 / p. 52).

5. If the slits are not horizontal, loosen the screw on the wheel and adjust it so that the slits are horizontal in both end positions.

Adjusting the grid switch

Switch S1 (Fig. 29 / p. 53) on the detector table disables the high voltage when the grid is in the turning point. If the switch is not adjusted correctly, the high voltage is active when the grid is standing still.

To minimize this risk of the high voltage being active when the grid is standing still, the high voltage should be disabled for as long as possible.

1. Move the grid to the left end position.
2. Loosen the three screws. It is now possible to adjust grid switch (S1) alongside the grid (Fig. 29 / p. 53).

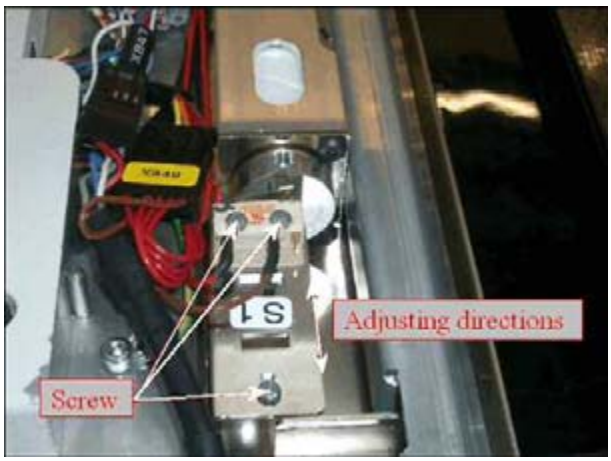

Fig. 29: Adjusting grid switch S1

3. Adjust the grid switch so that it activates and deactivates on either side of the slits ((Fig. 30 / p. 54) and (Fig. 31 / p. 54)). You'll hear a "click" when the switch activates or deactivates.

Fig. 30: Adjusting the switch on edge 1

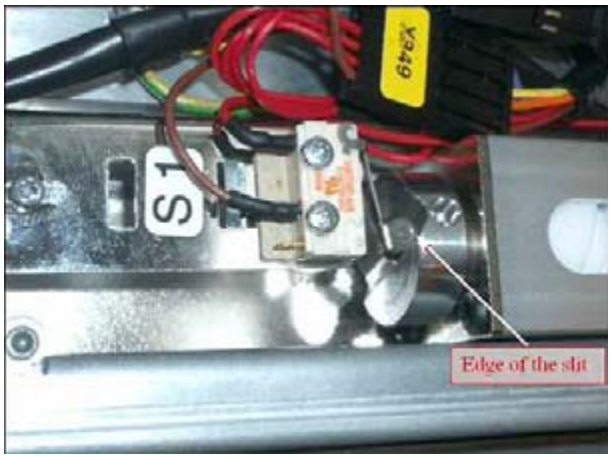

Fig. 31: Adjusting the switch on edge 2

4. Tighten the three screws.
5. Move the grid to the other end position and check that the grid switch activates/deactivates on either edge of the slits ((Fig. 30 / p. 54) and (Fig. 31 / p. 54)).

Adjusting the grid location

1. Open the carbon detector cover.
2. Make sure the grid is mounted parallel to the detector and is lined up with the front of the table.

   The front switch and the springs for the grid holders (left and right) have to be engaged, see **System Start-up, SPB7-250.815**.., the Detector Installation section for more detailed information.

3. Make sure that the springs move up and down easily.

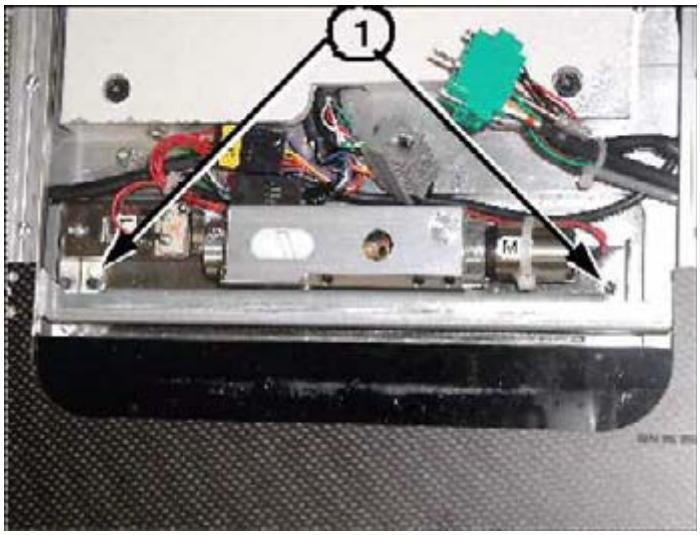

Fig. 32: Grid motor location

4. Move the grid to the left and right position. Be sure that space between the grid bracket and grid angle is the same on both sides. Otherwise loosen the two screws from the grid motor support (1/Fig. 32 / p. 55) and adjust these spaces.

Adjusting the grid speed

1. Start the service software.

   Main menu -> Configuration -> Grid speed

2. Set the parameter as shown in (Fig. 33 / p. 55).

Fig. 33: Adjusting the grid motor speed

3. Check the grid speed with the oscilloscope.

   The grid speed can be measured with the oscilloscope. Also see Mammomat Novation, **System Start-up...,SPB7-250.815**..., the X-Ray Tube Checks chapter, for systems with WH AWS or Installation Instructions... **SPB7-250.812**...for systems with DROC:

   Measurement

   - Switch the system OFF.
   - Connect the oscilloscope as follows:

     Channel 1 to measuring point HV_ACT on the D750, 1 V/T.

     Channel 2 to measuring point Grid_M on the D802, 10 V/T.

- Select time base 0.4 s/T.
- Switch the system ON.
- Select 28 kV, Mo/Mo, 500 mAs.
- Release an exposure.
- Evaluate the oscilloscope diagram.

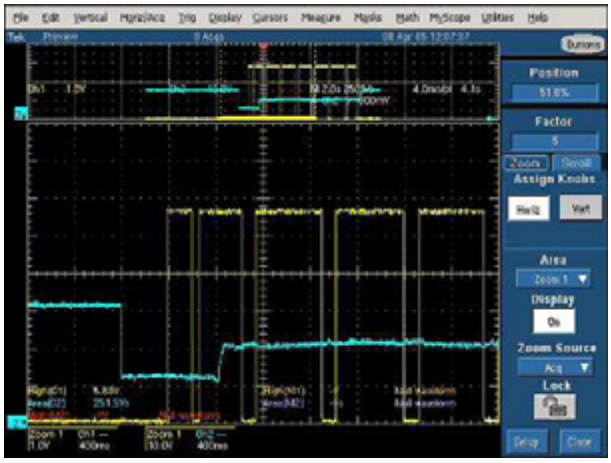

Fig. 34: Sample oscilloscope diagram

The high-voltage period in a steady state condition (after the 3rd period) has to be between 500 ms and 750 ms (Fig. 34 / p. 56).

4. If the grid lines are still visible after this process, increase, i.e.(change), the grid slow speed from 40% to 50% and check this test again.
5. If the grid's slow speed was changed, back up the stand data.

Final steps

Reinstall the covers.

Replacing generator modules

General

The generator is located on the back of the stand. It consists of several modules connected by cables. These modules have been developed in such a way that no electrical settings are necessary in case of a replacement. The modules are mounted on the generator frame with the help of metal rails. They are each fastened by 2 screws located on the left side.

Figure 1 shows the generator modules.

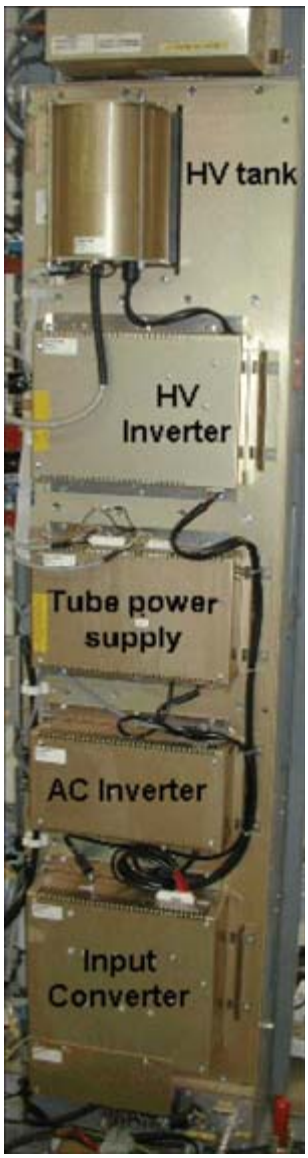

Fig. 35: Generator

- High-voltage tank
- High-voltage inverter
- Tube power supply
- AC inverter

- Mains input converter

Required documents

Software System Stand, SPB7-250.816.03...

System Start-up with WH AWS, SPB-7.250.815...for systems with AWS or Installation Instructions and Start-up, SPB7-250.812.04.. for systems with DROC.

QC Manuals

Tools

Standard tool kit

Service PC

Oscilloscope

⚠WARNING

It is very important to begin any work on the equipment by disconnecting it from the power supply via the main circuit breaker.

➪ **Before removing or inserting any of the modules, switch off the equipment.**

Replacing a module

- Turn off the system and disconnect it from the power supply.
- Remove the covers from the back of the Mammomat stand.
- Disconnect corresponding plug-in connections of the module.
- Remove the mounting screws (2x screws located on the left side).
- Shift the module to the left and remove it.
- Insert the new module und tighten the screws.
- Reestablish the plug-in connections.
- Switch on the system.

Tube power supply

The frequency of the rotating anode has to be checked after the tube power supply module is replaced. To do so, load the stand service software by selecting **Main menu->Normal mode->Generator data**.

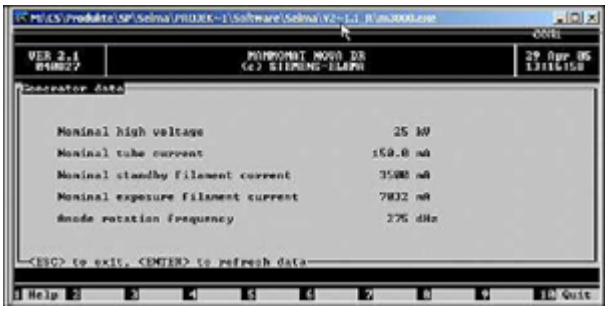

Fig. 36: Generator data

The "anode rotation frequency" value is ten times the rotation frequency of the last exposure in Hz (Fig. 36 / p. 59).

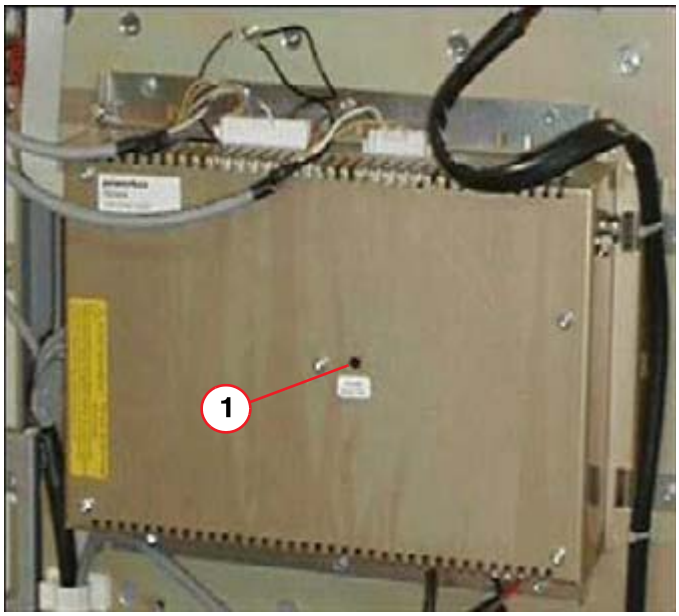

Fig. 37: Tube power supply

The frequency of the rotating anode must be > 148 Hz. If this is not the case, it can be set at the potentiometer "anode drive freq." (1/Fig. 37 / p. 59).

Additional requirements for replacing the **tube power supply module**:

Adjusting the grid voltage

1. Turn wing 1 toward the front, install the magnification table, and set a magnification of 1.8.
2. Set the digital multimeter to VDC and connect to cathode connections of the X-ray tube (- to "h3", + to “G”). The document supplied with the X-ray tube contains the necessary grid voltage values (= reference values).
3. Select Mo/Mo on the console.
4. Set the grid voltage for Mo/Mo to the reference value by adjusting the potentiometer marked “Bias MO” on the left side of the tube power supply module.
5. Select W/Rh on the console.

6. Set the grid voltage for W/Rh to the reference value by adjusting the potentiometer marked “Bias W” on the side of the tube power supply module.

After replacing one of the following modules, the tube voltage, current and mAs values have to be checked. For more information see the "X-Ray Tube Checks" chapter in Mammomat Novation, **System Start-up, SPB7-250.815..** for systems with AWS or **Installation Instructions and Start-up**,**SPB7-250.812..** for systems with DROC:

- High-voltage tank
- High-voltage inverter
- Tube power supply

Depending on the country where the system is installed, additional tests have to be performed, i.e., RöV §16 in Germany or DHHS regulations in the USA. Also see the QC manual.

Final steps

- Mount the covers on the back of the Mammomat.
- Check the protective ground resistance.

Replacing AWS Celsius 420

General

These instructions describe the work steps necessary for replacing the AWS computer (Celsius 420).

Fig. 38: PC Celsius 420

NOTE

To restore the original settings after replacing computers, all system settings need to be backed up beforehand. Otherwise, all configuration data must be re-entered manually.

A back up should be performed before replacing computers.

Required documents

Software, System WH AWS, SPB7-250.816...(depending on the installed version)

Start-up, WH AWS, SPB7-250.815.02..

Tools

Standard tool kit

NOTE

The replacement computer comes with a new PCI card. The software is not installed at the time of delivery.

NOTE

The license key and the service password of the old system are required for the installation of the new computer. These should be retrieved from the old system beforehand; the license key is also stored on the "License" disk.

Work steps

- Turn the system **OFF**.
- Remove all connections (cables) at the back of the computer.

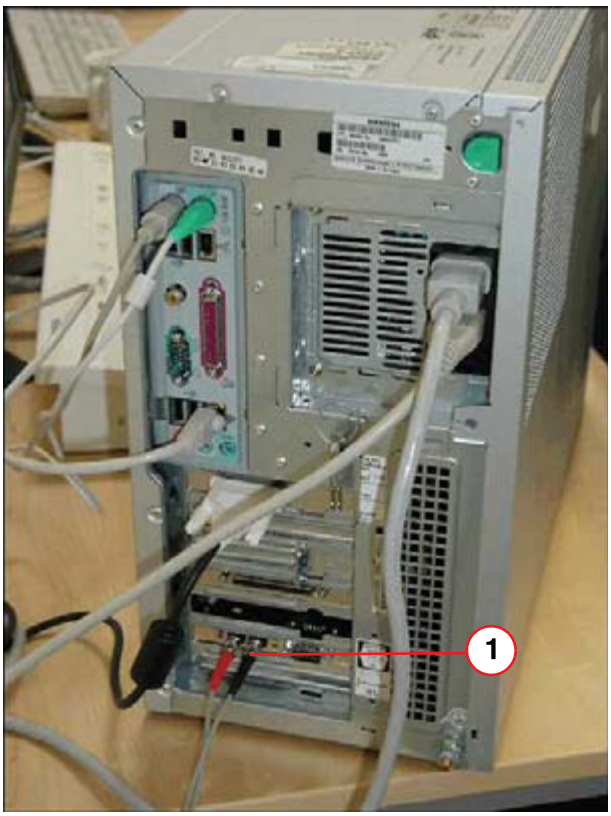

Fig. 39: AWS backside

- Pay attention to the fiber optic cables (connections between Brick and PCI card). These cables and plugs should be handled with care (1/Fig. 39 / p. 62).

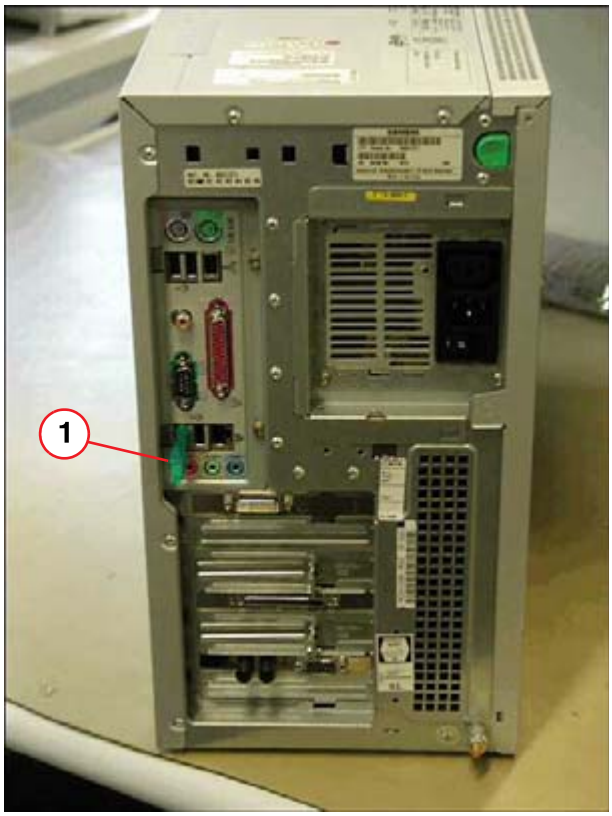

Fig. 40: AWS

- Remove the dongle from the old computer and attach it to the new one (1/Fig. 40 / p. 63).
- Connect the connecting cables to the new computer.
- Software installation:

  The "WH AWS Software Reinstallation" chapter in the technical documentation "**Software, System WH AWS, SPB7-250.816....**" (depending on installed WH AWS version) describes the steps necessary for installing the software.

You can refer to the "**Start-up, WH AWS(SPB7-250.815.02..)**" if not all settings have been backed up and some settings are missing after the restore operation.

Final steps

Perform a test exposure with a phantom.

Chapter	Changes
Replacing basic unit components	Part number changed. Detector replacement information added.
Replacing basic unit electrical assemblies	Link inserted Access to Brick configuration adapted
Compression unit, Replacing stand boards, Collimator and D814, Grid, Replacing generator modules, Replacing the AWS	New chapter